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DAMAGE TO PONDEROSA PINE LUMBER AND RUSTIC POLES BY THE BLACK-HORNED PINE BORER

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Damage to seasoned ponderosa pine lumber by a roundheaded borer, Callidium antennatum Newman, var. hesperum Casey, is of fairly common occurrence in the pine region of the West where lumber is seasoned or stored in open yards near pine forests. This damage has been found to occur only in lumber stocks which have been sawn so as to leave strips of bark still adhering to the wood. Poles and slabs used for rustic bark finish are also attacked.

The insect responsible for this damage is a native beetle which has been commonly known as the Black-Horned Pine borer or "bark loosener." It is a species common in the forests, where it attacks the logs and limbs of dead ponderosa pine and sugar pine, loosening the bark by feeding between the bark and sapwood. Very closely allied species with similar habits occur in white fir, Douglas fir, incense cedar, and juniper.

Nature of Injury

Damage to lumber is caused by the burrows, or mines, in the wood made by the larvae of this insect (fig. 1). During the early feeding stages the larvae first mine the inner bark and lightly score the surface of the sapwood. Later, as they mature, the larvae burrow into the sapwood for several inches, causing a fairly round hole about one-half inch in diameter (fig. 2). The mines made by immature larvae before entering the sapwood cause little damage; however, burrows or galleries made by the mature larvae in the sapwood cause serious defects in boards sawn from infested stock (fig. 3). Damage to rustic logs is due mainly to the fact that the larval mines cause the bark to loosen and fall from the log.

General Appearance and Seasonal History of the Insect

The adult beetle (fig. 4, d) is flat and oblong in shape, bluish black, and about one-half inch in length. The larva is a yellowish-white grub, about three-fourths of an inch in length when full-grown, with small but distinct pairs of legs on the first three segments of the body.

Under field conditions in the ponderosa pine region the adults emerge from their galleries in the wood in late April, May, and early June. During the ensuing flight period the females deposit eggs on the bark surface of dead trees or on material from felled trees, such as slabs on which the inner bark has become fairly dry. Although very little is known of the egg-laying habits, it is evident that the eggs are usually laid in bark crevices as close to the inner bark as possible. No eggs are deposited on sawn lumber or other wood material unless there is a strip of bark adhering to the sapwood.

After hatching, the larvae work their way into the layer of dead cambium and inner bark, where they start feeding. In the early stages of larval feeding during May and June, the larvae are so small that they are barely noticeable and can be detected only with the aid of a lens. During the course of feeding each larva cuts a flat, irregular burrow between the bark and wood. These burrows, or mines, have no definite pattern and are packed with a fine granular sawdust. The feeding period continues through the summer months, the width of the mines increasing as the larvae grow. The surface only of the sapwood is scored, but all the inner bark is thoroughly pulverized by these mines (fig. 2).

By fall the larvae are about three-fourths of an inch in length and have reached maturity. They then enter the wood to pupate. Each larva first bores a tunnel straight into the wood and at a right angle to the surface for a depth of about 2 inches; it then makes a right-angle turn, following the grain of the wood for another 2 inches. This last 2-inch length of tunnel is therefore parallel to the surface of the sapwood. The terminal portion of the gallery, or tunnel, is slightly enlarged so as to form a cell in which pupation takes place. However, before going into a dormant condition to enter the prepupal stage, the larva moves back up the gallery and extends the tunnel through the outer bark almost to the surface. This provides for an exit through which the adult beetle can finally emerge by merely pushing away a few of the outer bark scales. As a final preparation before going into the overwintering stage, the larva walls itself in by building a plug of sawdust across the gallery just in front of the pupal cell. (Figs. 2 and 3.)

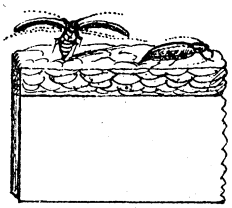
In the ponderosa pine region of the Sierra Nevada and Cascade Mountains there is but one complete generation annually. Records in the vicinity of Susanville, Calif., indicate that the adult beetles start to emerge about May 1, and that the peak of the flight season occurs from May 15 to June 15. A few stragglers have been observed in flight as late as July 1. In warmer localities in the lower elevations on the western slopes of the Sierras, adults have been observed in flight during early April.

In northeastern California the larval feeding period extends through July and August; and by September 15 the full-grown larvae have entered the wood to form the pupal cells. The majority of the brood pass the winter in the pupal stage, but a few may go through the winter as prepupal larvae. The new adults form during April and start emerging in May. (See outline of seasonal history, page 4.)

The period required for complete development from egg to new adult can be accelerated by sustained warm temperatures. This was demonstrated by laboratory tests when infested boards containing prepupal larvae were collected in September at Susanville, Calif., and were stored in the laboratory during the following fall, winter, and spring at temperatures ranging from 60° to 75° F. Under these conditions adults emerged from this stock in December and January. These new adults reattacked the same stock, and adults developing from a second generation emerged during May, June, and July. From this it is apparent that where sufficiently high temperatures are maintained at least two generations may be produced annually.

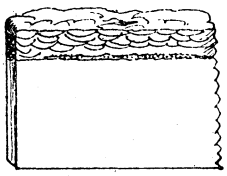
OUTLINE OF SEASONAL HISTORY OF THE BLACK-HORNED PINE BORER IN EASTSIDE PINE REGION OF OREGON AND CALIFORNIA

JUNE



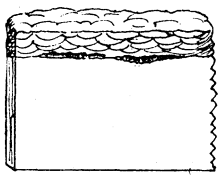
Adults in flight attack dead limbs, logs and slabs. Eggs are deposited on outer bark.

JULY



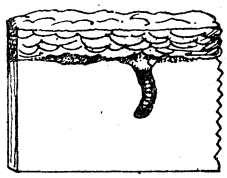
Young larvae feed between bark and wood. Feeding mines are still very small and difficult to detect.

AUGUST



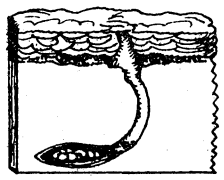
Larvae enlarge mines between bark and wood. Larvae grow rapidly during this period and the mines are more easily detected.

SEPTEMBER



Larvae become nearly full-grown and start to extend the overwintering galleries into sapwood.

OCTOBER

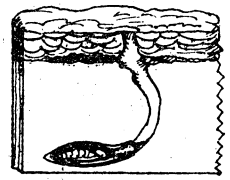


Full-grown larvae complete overwintering galleries, make the pupal cell, and go into prepupal condition.

NOVEMBER to MARCH, inclusive.

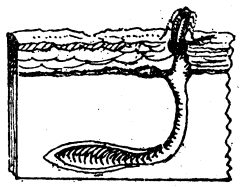
This is the dormant overwintering period. The majority of the broods pupate in the fall, but a few go through the winter as prepupal larvae. This dormant period is passed in the pupal cells at the end of the galleries which the larvae wall in with frass.

APRIL



As activity returns, pupae transform to new adults; prepupal larvae go through changes to pupae and new adults.

MAY



New adults leave pupal cells, push their way out through outer bark scales, and begin flight.

Development of Injury in Outdoor Lumber Yards

As these beetles do not work in green lumber, their attack is made only on seasoned or partially seasoned material. The attack occurs therefore after the logs have passed through the mill. If lumber stock is stored in yards which can be reached by the beetles during their flight period, it becomes susceptible to attack.

New lumber stock that is exposed to the beetles during May, June, and early July of one season may be attacked and become infested during that season. However, material that is placed in the yards after July 15 will not be attacked until the flight period of the following season.

The beetle population which initiates the first attack upon new stock is seldom great enough to exhaust entirely the food supply in the cambium area available for larval feeding. The beetles will, therefore, reattack the same material from which they have emerged. For this reason, the longer that slab material remains in the yards, the heavier will become the infestation and damage in the old stock. This process of re-attack, year after year, will continue until the bark becomes entirely loosened from the wood and there is no longer any sound cambium and inner bark on which the larvae can feed.

Logs cut during the spring and early summer are often characterized by a condition of the sap that causes the bark to "slip" when the slabs shrink rapidly during the drying-out process. On boards cut from logs of this type, the bark strips will loosen and will be free from damage by Callidium.

How to Detect the Presence of Callidium Infestation

The presence of Callidium larvae during the early stages of feeding and development is difficult to detect in lumber stocks. The eggs and very young larvae are so tiny that they can be found only by close examination. However, as the larvae become larger their mines can be seen easily by removing the bark. As development advances, granulated sawdust usually falls out along the edges of the bark strips, and this is the best indication of infestation in lumber piles. In the inspection of stock piles, it is good practice to tap bark strips with a hammer to see if the bark has become loosened by larval mines.

Other Insects Causing Similar Injury

There are other species of insects which feed under the bark of dead pines and whose work resembles that of the black-horned pine borer. A bostrichid beetle, Stephanopachys pacificus Csy., occurs quite commonly in the same material with Callidium. This insect mines and powders the inner bark, but does not mine the wood, so the damage is negligible. Engraver beetles, Ips spp., will also attack under bark strips, but only before the inner bark is thoroughly seasoned.

Suggestions for Prevention and Control of Damage

Since Callidium damage occurs only in material to which a certain amount of bark still adheres after milling, it can easily be prevented in lumber yards by peeling the logs, or by clean-edging the boards before they are placed in the yards to season.

However, for certain uses of the softer quality ponderosa pine, it is desirable to save as much as possible of the soft outer sapwood during the process of manufacture. The practice of some mills is to saw the log so that a considerable amount of bark is left on the edges of the slabs so as to utilize as much as possible of the soft outer sapwood. This is the material that is likely to become infested. Where this method of sawing and seasoning is employed, it is still possible to control or at least greatly minimize the damage caused by Callidium. Control is accomplished mainly by close inspection and management of lumber stock in the yards where it is stored.

The outstanding points to be considered in dealing with Callidium infestations are:

1. In the initial sawing of the log and in resawing for the final boards, either clean-edge the boards or leave as little "wane" or bark strips as possible.

2. Carefully inspect any sawn material containing bark strips that has been stored in open yards during the flight period (May, June, and July). By this practice it is possible to cull out any infested boards before they are sent to the manufacturing plant or to purchasers of the stock.

3. Stock that contains bark strips should not be stored in open yards for longer than one year without inspection and culling out of infested material. The longer the stock is exposed to attack, the heavier the damage will become because of reinfestation.

4. To clean up infested stock, the boards should be edged so as to remove all larval mines and overwintering galleries, and the edgings should be burned to destroy the insects.

5. Destroy or remove from the yards old slab piles and unused stock which cannot be utilized. These serve as breeding places for Callidium beetles which will attack the fresh stock in the yards.

6. Where dry kiln facilities are available, heat treatment may be used to kill the larvae, pupae, and adults in infested lumber. The dry kiln method used to destroy powder-post beetles, which requires a temperature of 180° F., maintained for about an hour, is recommended.1/

1/ Snyder, T. E. Preventing Damage by Lyctus Powder-Post Beetles. U. S. Dept. Agr., Farmers' Bulletin 1477. March 1926 (rev. Sept. 1936).

Heat treatment, however, will not prevent subsequent attack by Callidium if timber with adhering bark strips is again stored where it is exposed to the flight of the adults.

7. Control of Callidium in rustic stock is difficult after unbarked poles and slabs have been installed in buildings. Nailing the loosened bark to the wood is a good practice, since no further attack or damage results after the inner bark has been thoroughly mined. Damage to rustic stock can be prevented, however, by injecting chemicals into the green trees before they are seasoned. This may be accomplished by any one of the accepted methods of tree injection. 2/ 3/

2/ Craighead, F. C., R. A. St.George, and B. H. Wilford. A Method for Preventing Insect Injury to Material Used for Posts, Poles, and Rustic Construction. U. S. Dept. Agr., Bureau of Entomology and Plant Quarantine, E-409 (processed). June 1937.

3/ Lantz, A. E. An Efficient Method for Introducing Liquid Chemicals into Living Trees. U. S. Dept. Agr., Bureau of Entomology and Plant Quarantine, E-434 (processed). May 1938.

TYPES OF OVERWINTERING GALLERIES OF THE BLACK-HORNED PINE BORER IN PONDEROSA PINE LOGS AND LUMBER

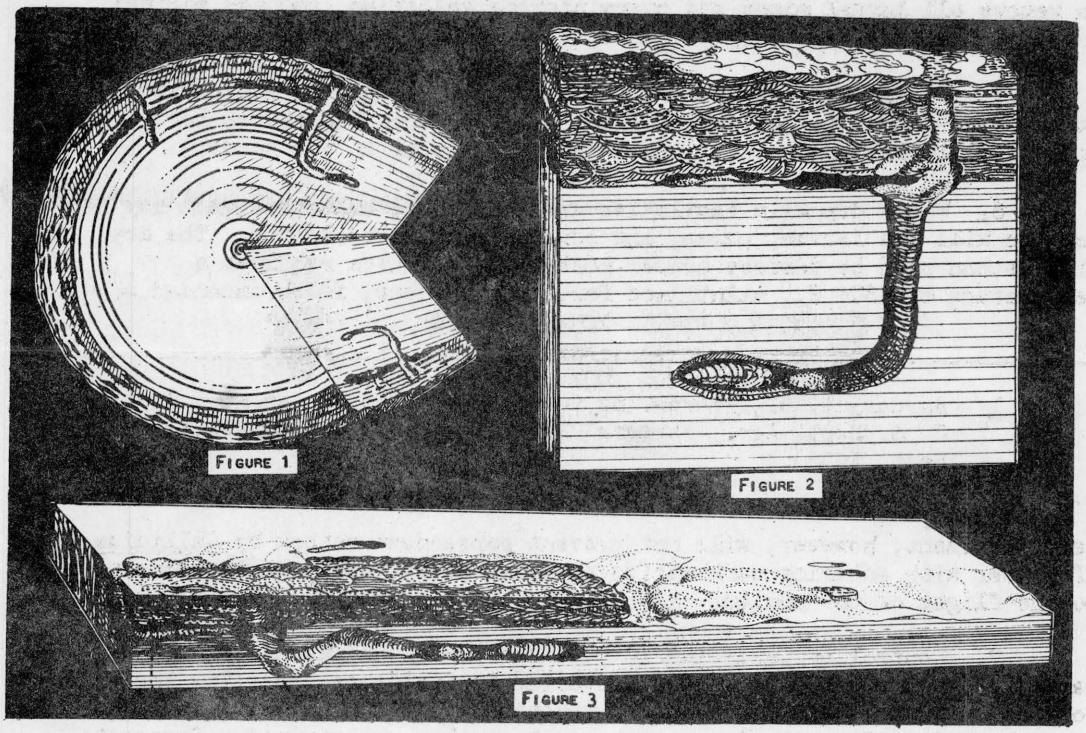
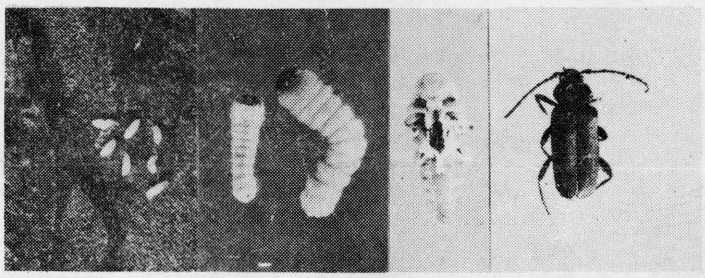


Figure 1.—A small log with section removed to show the normal type of galleries which larvae extend into limbs and logs that are not sawn into lumber. The normal depth to which the galleries are extended down into the wood before turning to form the pupal cell is usually about 2 inches. The galleries do not enter the heartwood.

Figure 2.--Face of a section cut longitudinally through a slab to expose one half of an overwintering gallery. This exposes the larval feeding mine between the bark and wood (the inner bark is largely consumed and the surface of the sapwood is scored), the exit gallery which the larva extended almost to the surface of the outer bark, and the pupal cell at the lower end of the gallery with pupae in place. Directly in front of the pupa is the plug of frass and borings with which the larva closed the cell before it became dormant and transformed to a pupa.

Figure 3.--Abnormal type of gallery which was excavated in a board 1 inch in thickness with bark strip attached. After the larva completed its feeding and started to excavate the overwintering gallery, it could not extend this to the usual 2-inch depth into the wood. It therefore extended most of the gallery longitudinally, keeping within the 1-inch thickness of wood that was available.



a b c d

Figure 4.--Life-history stages of the black-horned pine borer. a, Eggs on surface of outer bark (enlarged); b, half-grown larva (left), and prepupal larva (right); c, pupa; d, adult.